PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 13127PC2	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/AU2005/000500	International filing date *(day/month/year)* 6 April 2005	Priority date *(day/month/year)* 8 April 2004
International Patent Classification (IPC) or national classification and IPC Int. Cl. *C12Q 1/68* (2006.01)		
Applicant THE STATE OF QUEENSLAND ACTING THROUGH ITS DEPARTMENT OF HEALTH et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. [X] *(sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      - [ ] sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      - [ ] sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. [ ] *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

[X]	Box No. I	Basis of the report
[ ]	Box No. II	Priority
[ ]	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
[ ]	Box No. IV	Lack of unity of invention
[X]	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
[ ]	Box No. VI	Certain documents cited
[ ]	Box No. VII	Certain defects in the international application
[ ]	Box No. VIII	Certain observations on the international application

Date of submission of the demand 24 August 2005	Date of completion of this report 23 March 2006
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **Sophina Calanni** Telephone No. (02) 6283 2038

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AU2005/000500

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

[X] The international application in the language in which it was filed

[ ] A translation of the international application into , which is the language of a translation furnished for the purposes of:

[ ] international search (under Rules 12.3(a) and 23.1 (b))

[ ] publication of the international application (under Rule 12.4(a))

[ ] international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

[ ] the international application as originally filed/furnished

[X] the description:

pages **1-29** as originally filed/furnished
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

[X] the claims:

pages as originally filed/furnished
pages* as amended (together with any statement) under Article 19
pages* **30-32** received by this Authority on **24 August 2005** with the letter of 24 August 2005
pages* received by this Authority on with the letter of

[X] the drawings:

pages **1/1** as originally filed/furnished
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

[X] a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. [ ] The amendments have resulted in the cancellation of:

[ ] the description, pages
[ ] the claims, Nos.
[ ] the drawings, sheets/figs
[ ] the sequence listing *(specify)*:
[ ] any table(s) related to the sequence listing *(specify)*:

4. [ ] This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

[ ] the description, pages
[ ] the claims, Nos.
[ ] the drawings, sheets/figs
[ ] the sequence listing *(specify)*:
[ ] any table(s) related to the sequence listing *(specify)*:

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims **1-24**	**YES**
	Claims	**NO**
Inventive step (IS)	Claims **1-24**	**YES**
	Claims	**NO**
Industrial applicability (IA)	Claims **1-24**	**YES**
	Claims	**NO**

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 Whiley, D. M. et al., 2004 (July), *European Journal of Clinical and Microbial Infectious Diseases*, **23**: 705-710.

D2 Glustein, J. Z. et al., 1999, *Molecular Diagnosis*, 4: 233-239.

The applicant's invention resides in a method for the detection of *Neisseria gonorrhoeae* based on the detection of the porA pseudogene. The use of the porA pseudogene as a target for *N. gonorrhoeae* detection provides improved clinical sensitivity and specificity when compared to other PCR-based detection methods (p. 6 lines 22-28).

P Category Documents

D1 Whiley, D. M. et al., 2004, *European Journal of Clinical and Microbial Infectious Diseases*, **23**: 705-710.

With regard to the document listed above, this is a document that was published prior to the international filing date but later than the priority date claimed, and which would otherwise be considered to be of particular relevance to the present application. Under the PCT, novelty is considered only in respect of documents published before the priority date. Should there be any issue with the priority date presently claimed this document may be relevant to the novelty and/or inventiveness of the invention claimed.

Novelty (N) and Inventive Step (IS)

D2 discloses a PCR-based simplex assay for the detection of *N. meningitidis* and *N. gonorrhoeae*. In the method described primers directed to the *porA* gene are used to amplify the gene and the PCR product is then detected using an internal oligonucleotide probe for *porA* (p.234, *Primer Synthesis for PCR* and *Liquid Hybridization-Gel Retardation Analysis of Amplification Products)*. While the method described discloses primers that enable the detection of both *N. meningitidis* and *N. gonorrhoeae*, there is no disclosure of primers which are not capable of hybridising to a porA nucleic acid of N. meningitidis as presently claimed. Therefore the subject matter of claims 1-24 is new and meets the requirements of Article 33(2) PCT with regard to novelty.

Continued in Supplemental Box

Supplemental Box Relating to Sequence Listing

Continuation of Box No. I, item 2:

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this report was established on the basis of:

   a. type of material

   - [ ] a sequence listing
   - [X] table(s) related to the sequence listing

   b. format of material

   - [X] on paper
   - [ ] in electronic form

   c. time of filing/furnishing

   - [X] contained in the international application as filed
   - [ ] filed together with the international application in electronic form
   - [ ] furnished subsequently to this Authority for the purposes of search and/or examination
   - [ ] received by this Authority as an amendment* on

2. [ ] In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

The present application claims PCR primers having the nucleotide sequences of SEQ ID NO: 1-9. The specification indicates that the nucleotide sequences are set forth in Table 1 and Figure 1 (p. 5 lines 4-5; p. 6 Brief Description of Figures). However Table 1 and Figure 1 do not clearly identify the primers according to their SEQ ID NO. Based on the information provided in the Brief Description of Figures the claims have been searched on the assumption that the SEQ ID NOs correspond to the primers listed in Figure 1 as set out below.

- NG-pap-1 = SEQ ID NO: 1
- NG-pap 2 = SEQ ID NO: 2
- NG-pap-p1 = SEQ ID NO: 3
- NG-pap-p2 = SEQ ID NO: 4
- NG-pap 3 = SEQ ID NO: 5
- NG-pap 4 = SEQ ID NO: 6
- NG-pap 5 = SEQ ID NO: 7
- NG-pap 6 = SEQ ID NO: 8
- NG-pap 7 = SEQ ID NO: 9

* *If item 4 in Box No. I applies, the listing and/or table(s) related thereto, which form part of the basis of the report, may be marked "superseded."*

Supplemental Box

Continuation of Box V: **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability**

Furthermore, claims 1-24 meet the criteria set out in PCT Article 33(3) with regard to the requirement of Inventive Step. As discussed previously, the prior art discloses an assay that allows the detection of *N. gonorrhoeae* and *N. meningitidis*. Thus, the citation does not obviously suggest to the person skilled in the art that an assay based on the detection of the pseudogene porA would be capable distinguishing between *N. gonorrhoeae* and *N. meningitidis*. The method described in the prior art does not allow the discrimination of *N. gonorrhoeae* from *N. meningitidis* and there is no indication that sufficient variability in the porA gene of these two *Neisseria* species exists such that discrimination of the two species would be possible.

Industrial Applicability (IA)

The invention defined in the claims is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT.

CLAIMS

1. A method of determining whether an individual is or has been infected with *Neisseria gonorrhoeae*, said method including the step of using one or more oligonucleotides to detect said isolated porA nucleic acid of *Neisseria gonorrhoeae*, if present in a biological sample obtained from said individual, a presence of said porA nucleic acid indicating that said individual is or has been infected with *Neisseria gonorrhoeae*, wherein said one or more oligonucleotides are not capable of hybridizing to a porA nucleic acid of *Neisseria meningitidis* sufficiently to enable detection of said porA nucleic acid of *Neisseria meningitidis* if present in said biological sample.

2. The method of Claim 1, wherein said method includes the step of distinguishing said isolated porA nucleic acid of *Neisseria gonorrhoeae* from a porA nucleic of *Neisseria meningitidis* present in said biological sample.

3. The method of Claim 2, wherein said porA nucleic acid of *Neisseria gonorrhoeae* is distinguished from another Neisseria species other than *N. meningitidis*.

4. The method of Claim 1, including the step of subjecting the biological sample to nucleic acid sequence amplification under conditions which facilitate amplification of said isolated porA nucleic acid of *Neisseria gonorrhoeae* to produce an amplification product.

5. The method of Claim 4, wherein the amplification product corresponds to a fragment of a *Neisseria gonorrhoeae* porA pseudogene.

6. The method of Claim 5, wherein nucleic acid sequence amplification is performed under conditions which facilitate amplification of said isolated porA nucleic acid of *Neisseria gonorrhoeae* to a detectable level but which do not facilitate amplification of said porA nucleic of *N. meningitidis* to a detectable level.

7. The method of Claim 6, wherein nucleic acid sequence amplification is performed using one or more PCR primers having a nucleotide sequence selected from the group consisting of SEQ ID NO:1 and SEQ ID NO:2.

8. The method of Claim 4, wherein said one or more oligonucleotides comprise a probe for detecting said amplification product by probe hybridization.

9. The method of Claim 8, wherein the probe is has a nucleotide sequence selected from the group consisting of SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; SEQ ID NO:8; SEQ ID NO:9.

10. The method of Claim 9, wherein the probe is has a nucleotide sequence selected from the group consisting of SEQ ID NO:3 and SEQ ID NO:4.

11. The method of Claim 8, wherein detection of said amplification product is performed using fluorescence resonance energy transfer (FRET).

12. A method of determining whether a human individual is or has been infected with *Neisseria gonorrhoeae*, , said method including the steps of:

(i) subjecting a biological sample obtained from said human individual to nucleic acid sequence amplification using primers having respective nucleotide sequences according to SEQ ID NO:1 and SEQ ID NO:2, to produce a porA *Neisseria gonorrhoeae* amplification product from a *Neisseria gonorrhoeae* porA nucleic acid if present in said biological sample; and

(ii) detecting said amplification product, if present, by probe hybridization and fluorescence resonance energy transfer (FRET) using oligonucleotides having respective nucleotide sequences according to SEQ ID NO:3 having a donor fluorophore and SEQ ID NO:4 having an acceptor fluorophore, whereby a presence of said porA amplification product indicates that said individual is or has been infected with *Neisseria gonorrhoeae*, .

13. An oligonucleotide which is capable of hybridizing to a porA nucleic acid of *Neisseria gonorrhoeae* sufficiently to enable detection of said porA nucleic acid, but which is not capable of hybridizing to a porA nucleic acid of *Neisseria meningitidis* sufficiently to enable detection of said porA nucleic acid of Neisseria meningitidis.

14. The oligonucleotide of Claim 12, wherein said oligonucleotide is not capable of hybridizing to a porA nucleic acid of another Neisseria species other than *N. meningitidis*.

15. The oligonucleotide of Claim 14 having a nucleotide sequence selected from the group consisting of SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; SEQ ID NO:8; SEQ ID NO:9.

16. The oligonucleotide of Claim 15 having a nucleotide sequence selected from the group consisting of SEQ ID NO:3 and SEQ ID NO:4.

17. A kit for detecting a porA nucleic acid of *Neisseria gonorrhoeae*, said kit comprising one or more oligonucleotides according to Claim 13 together with a DNA polymerase and/or one or more detection reagents.

18. The kit of Claim 17, wherein the one or more oligonucleotides have a nucleotide sequence selected from the group consisting of SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; SEQ ID NO:8; SEQ ID NO:9.

19. The kit of Claim 18, wherein the one or more oligonucleotides have a nucleotide sequence selected from the group consisting of SEQ ID NO:3 and SEQ ID NO:4.

20. The kit of Claim 17, further comprising one or more primers that facilitate amplification of an *Neisseria gonorrhoeae*, porA nucleic acid.

21. The kit of Claim 20, wherein the one or more primers have a nucleotide sequence selected from the group consisting of SEQ ID NO:1 and SEQ ID NO:2.

22. A nucleic acid array comprising one or more oligonucleotides according to Claim 13, immobilized, coupled, bound, impregnated or otherwise in communication with a substrate.

23. The nucleic acid array of Claim 22, wherein the one or more oligonucleotides have a nucleotide sequence selected from the group consisting of SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; SEQ ID NO:8; SEQ ID NO:9.

24. The nucleic acid array of Claim 23, wherein the one or more oligonucleotides have a nucleotide sequence selected from the group consisting of SEQ ID NO:3 and SEQ ID NO:4.